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(71) Applicant
Pace Controls Co Limited (United Kingdom),
Unit 1, Icknield Trading Estate, Icknield Square, Hockley,
Birmingham B16 0PP, West Midlands

(72) Inventor
Vrinah Ann Cowdrill

(74) Agent and/or Address for Service
Forrester Ketley & Co., Rutland House, 148 Edmund Street,
Birmingham B3 2LD

(54) Disturbance sensors for barriers

(57) A security system for detecting intruders crossing a boundary, and more particularly a security device which may be provided along a fence, wall, gate, or other boundary member, to detect an intruder crossing over the boundary member comprises a security device comprising an elongate element which is adapted to extend along an upper surface of a boundary member, means to sense a predetermined movement of said element relative to the boundary member, and means to provide a signal to an alarm means when said predetermined movement is sensed.

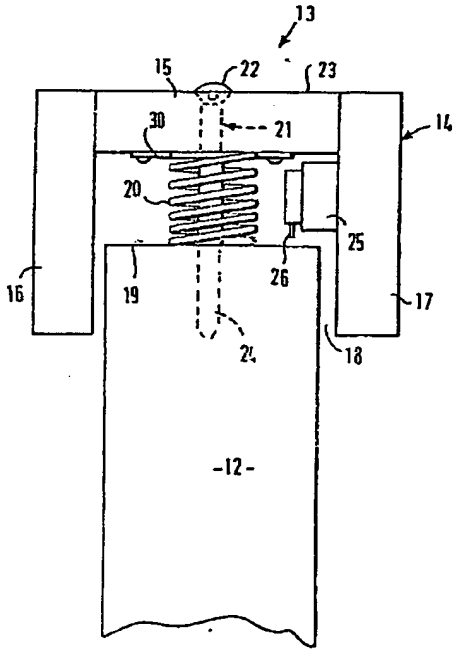

FIG 2

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.
The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

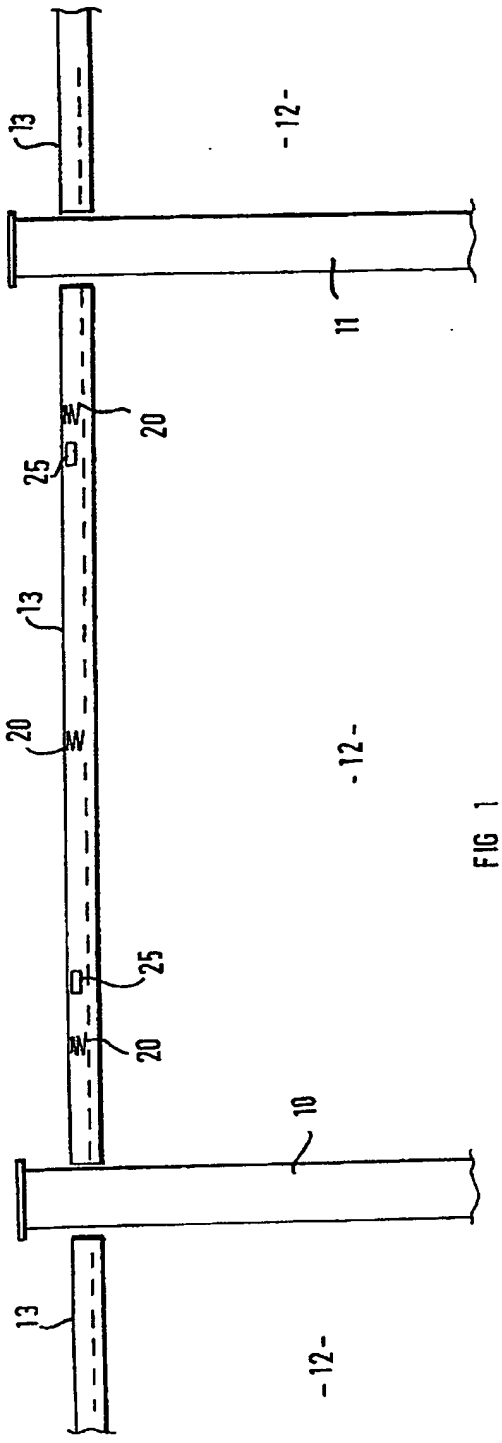

FIG 1

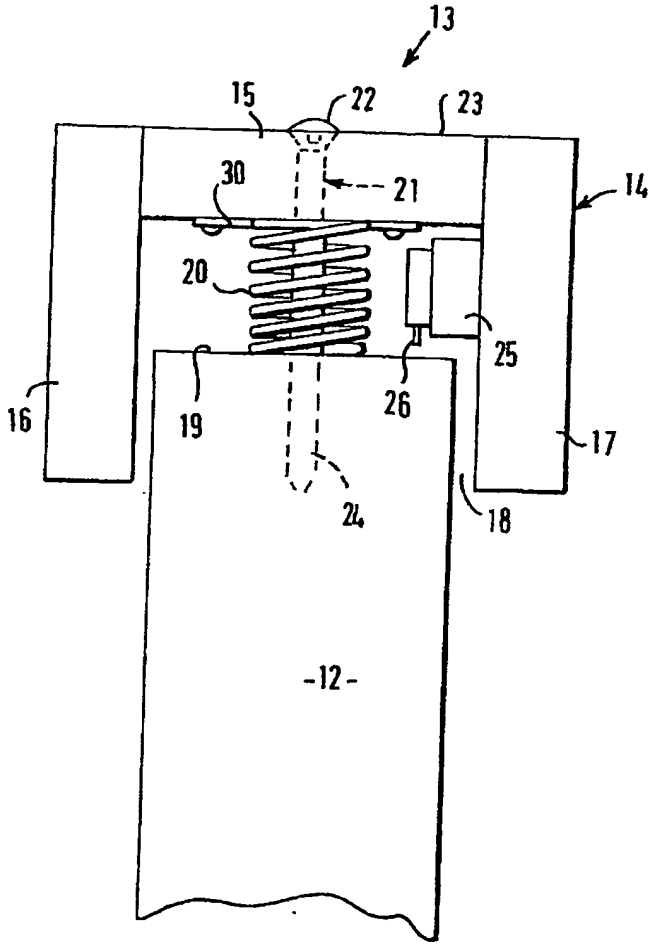

FIG 2

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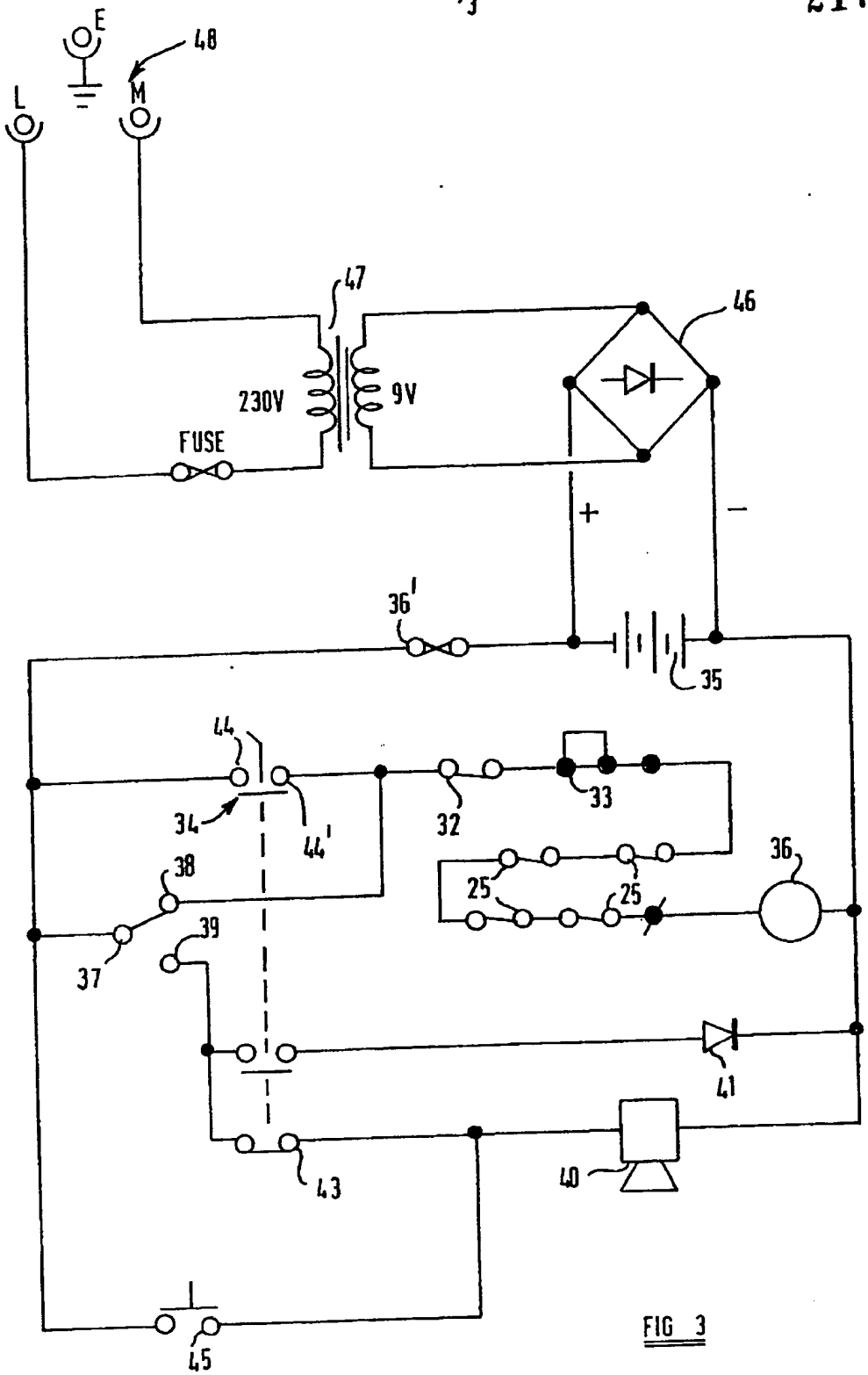

FIG 3

SPECIFICATION

Security system

Description of invention

This invention relates to a security system for detecting intruders crossing a boundary, and more particularly to a security device which may be provided along a fence, wall, gate, or other boundary member, to detect an intruder crossing over the boundary member.

It has been found that in many cases of burglary, burglars have enetered premises unnoticed after climbing, for example, a rear garden fence or wall.

An object of the present invention is to provide a new or improved security device.

According to one aspect of the invention we provide a security device comprising an elongate element which is adapted to extend along an upper surface of a boundary member, means to sense a predetermined movement of said element relative to the boundary member, and means to provide a signal to an alarm means when said predetermined movement is sensed.

Thus an intruder, upon causing said predetermined movement of said element as the intruder crosses the boundary member, would actuate the alarm means.

Preferably said elongate element extends along the boundary member for at least half a metre, but where the boundary member comprises a fence having fencing panels which extend between posts, or a gate, preferably the elongate element extends substantially the entire distance between the posts, or gate posts.

Where the boundary member comprises a wall, the elongate element may extend along the entire wall which defines the boundary to be protected, or may be provided in sections where the boundary to be protected is long.

Generally, if desired, a plurality of shorter security devices may together protect a longer boundary.

Where a plurality of security devices in accordance with the invention are used together, preferably the devices each have connecting means to enable each device to co-operate, operatively with an adjacent device.

Preferably, said predetermined movement of the elongate element relative to the boundary member is greater than that which would be caused by the wind, or by an animal such as a cat or bird alighting on the elongate element so that inadvertent actuation of the alarm means is avoided.

For example, said predetermined movement may only be attained where a force greater than 20 kilograms is applied to the elongate member, and more preferably a force greater than 40 kilograms.

The amount of said predetermined movement may be governed by a resilient biasing means which acts between the elongate element and the boundary member, the force of the resilient biasing means being overcome as an intruder applies a greater force to the elongate element as he crosses the boundary member, to cause said predetermined movement.

It will be appreciated that the active force required to cause said predetermined movement of the elongate member may be adjusted by using resilient biasing means of different strength.

Said means which sense the predetermined movement of the elongate element may comprise a switch means, such as a micro switch, the contacts of which are broken as said predetermined movement is caused. Thus a break in electrical continuity would signal the alarm means.

Alternatively, the contacts of the switch means may be made as the predetermined movement of the elongate element occurs, to provide a signal to the alarm means.

The former arrangement is preferred because any tampering with the electrical circuit in which said contacts are located, which interrupts electrical continuity, for example, an intruder cutting a wire from the sensing means to the alarm means, would actuate the alarm means.

Any other electrical sensing means, such as an electronic strain gauge, or an electronic optical means, may be provided to sense a predetermined movement of the elongate element.

The elongate element may comprise a downwardly opening channel-shaped element and the fencing panel, or a rail at the top of the fencing panel, may be received in the mouth of the channel. Thus the elongate element may replace on existing top rail on a fencing panel, or an existing top rail may be received within the mouth of the channel.

Preferably a securing means which permits movement of the elongate element relative to the boundary member is provided, to secure the elongate element to the boundary element. For example, particularly where the fencing panel or top rail is made of timber or plastic, a nail, screw, or other fastener may pass through the base of the channel into the fencing panel or top rail. Where the fencing panel or top rail is made of metal, a bolt, self-tapping screw or other fastener may pass through the base of the channel into the panel or rail.

Conveniently, where a resilient biasing means controls movement of the elongate element relative to the boundary member, this comprises a coil spring and the fastener is received within the coils of the spring. Of course, any other resilient means could alternatively be provided.

The switch means, where the elongate element is of depending channel configuration, may be attached interiorly to one limb of the channel, or to the base of the channel as required. Where the switch means is a micro switch, a trigger of the micro switch may engage the boundary member as said predetermined movement occurs, to cause the contacts of the micro switch to break or make.

By adjusting the position of the micro switch, the amount of said predetermined movement of the elongate element required to actuate the alarm means, may be adjusted.

The elongate element could of course be of other configurations, such as an inverted L-shape, or may be substantially planar if required.

The security device may conveniently be part of a security system comprising said security device, an alarm means, and a control means.

The alarm means may comprise an audible, visual, or other warning, or the alarm means may signal a remote location that an intrusion has occured where an audible, visual or other warning is given.

The control means may comprise a control circuit which when electrical continuity of the micro switch or other switch means is maintained, maintains the contacts of a relay open or any other switch such as an electronic switch, by which power is supplied to the alarm means, open. A plurality of switch means are preferably provided along the elongate member, in which case preferably each switch means is arranged in series in the circuit so that any break in electrical continuity in any of the switch means or in any of the conductors connecting the switch means, signals the control means to operate the alarm means.

The control means and alarm means are preferably battery operated, in which case the battery may be rechargeable from the mains either continuously as power is drawn from the battery or batteries, or as and when required.

The security system may be key operated by an operator and when the alarm means has been actuated, the alarm may be arranged only to be deactivated by said key.

According to a second aspect of the invention we provide a boundary member extending upwardly from the ground or other support surface, a security device according to the first aspect of the invention extending along an upper surface of the boundary member.

The invention is particularly applicable where the boundary member is tall, i.e. at least one and a half metres, as an intruder would have to scale the boundary member, and would have to exert all of his weight on the elongate element, and thus cause said predetermined movement of said elongate element.

The invention will now be described with the aid of the accompanying drawings in which:

Figure 1 is a schematic drawing of an upper part of a fencing system incorporating a security device in accordance with the invention.

Figure 2 is a schematic end view of part of the fencing system of Figure 1.

Figure 3 is an example of a control and alarm means for use with the security device of Figures 1 and 2.

Referring first to Figure 1, a fencing system comprises a plurality of posts, two of which are indicated at 10 and 11, each of the posts extending upwardly from and being embedded in, the ground. Of course, the posts could be secured to any other support and not be embedded in the ground.

Extending between and secured to the posts are fencing panels 12. For example, the fencing panels 12 may comprise timber panels, chain link panels, or any other desired fencing panel. Extending between the posts along an upper surface of the fencing panels 12 are security devices indicated at 13. The security devices 13 are each of identical configuration and operation and hence only one security device 13 will be described hereinafter in detail.

Referring now also to Figure 2, the security device 13 comprises an elongate member 14 having a base 15 and two depending limbs 16 and 17, the limbs providing between them a mouth 18 in which the upper surface 19 of the fencing panel 12 is received.

The base 15 of the elongate element 14 is spaced from the upper surface 19 of the fencing panel 12 by resilient biasing means comprising a plurality of coil springs 20. As can be seen from Figure 1, three such springs 20 are provided along the length of the fencing panel although more or less springs could be provided if required. Movement of the elongate element 14 away from the upper surface 19 of the fencing panel 12, is restrained by a fastener 21 comprising a nail having a head 22 which engages upper surface 23 of the base 15 of the channel, a shank of the fastener 21 extending through the coils of the spring 20 into the fencing panel as indicated at dotted lines at 24. In the present example, the fencing panel is a timber panel although it will be appreciated that where, for example, the fencing panel is a chain link panel, an alternative means for securing the elongate element along the upper surface of the fencing panel would be required.

Of course in practice more than a single fastener 21 may be required, for example a fasteners for each of the three springs 20 may be provided, with additional fasteners if required.

The fastener 21 described, permits said movement of the elongate element 14 towards the surface 19 of the fencing panel against the force of springs 20 as the aperture provided in the base 15 of the channel for the shank of the fastener 21 is preferably slightly larger than the diameter of the shank of the fastener so as to give a clearance between the shank and the aperture.

Preferably the force of the springs 20 are sufficient to ensure that the wind, or a cat or bird alighting on the elongate element 14 will not cause significant movement of the elongate element 14 towards the surface 15.

Thus the springs 20 may be chosen so that a predetermined movement of the element 14 will only occur if a force greater than 20 kilos is applied to the element 14. Preferably the springs are chosen so that the predetermined movement is only caused by a force in excess of 40 kilos.

Security interiorly of the channel on limb 17 thereof, is a sensor comprising a micro switch 25. The micro switch 25 has a trigger 26 which is normally spaced from the upper surface 19 of the fencing panel 12, which spacing is maintained by virtue of the springs 20. However, if pressure is applied to the upper surface 23 of the channel element 14, against the force of springs 20, it will be appreciated that the trigger 26 will move towards the upper surface 19 of the fencing panel 12 until engagement occurs. Continued movement beyond this threshold, will cause contacts within the micro

switch 25 to be opened and thus provide a signal to a control and alarm means described hereinafter with reference to Figure 3. The position of the micro switch 25 and hence spacing of the trigger 26 from the surface 19 will govern the amount of movement of element 14 required to open the contacts of the switch 25.

It can be seen that a pair of micro switches 25 are provided along the length of the elongate channel element 14, although of course more than two or only one micro switch 25 may be provided as required. The micro switches 25 or other switches are preferably each part of a control circuit which will be described hereinafter with reference to Figure 3, conductors extending between the micro switches 25 within the channel shaped element 14, to a combined control and alarm means.

Of course any other sensor to provide a signal to an alarm means when said predetermined movement of the channel element 14 has occurred, may be provided, such as an electronic strain gauge, an electronic optical means, or proximity switch, such as a reed switch, or any other switch.

It can be seen that the uppermost coils of spring 20 bear on a bearing plate 30 secured to the underside of base 15 of the channel element 14 to ensure that the coils of the spring 20 do not foul the fastener 21 and prevent said predetermined movement occurring.

Although as described, the upper surface 19 of the fencing panel 12 is received within the mouth 18 of the channel element 14, and thus the channel element 14 provides a top rail for the fencing panel, it will be appreciated that by suitable modification, an existing top rail of a fencing panel may be received within the mouth 18 of the channel element 14. In this event, springs 20 would engage the upper surface of the top rail, and the fasteners 21, or other securing means, may be attached to the top rail. Further, the trigger 26 of the micro switch 25 would engage the upper surface of the top rail to signal the alarm means, when a predetermined movement of the channel element has occurred.

Although as described, a channel element 14 has been provided, of course an element 14 of any other configuration may be provided such as an elongate element of inverted L-shape or even a planar element, which extends along the upper surface 19 of the fencing panel. In this latter embodiment, the micro switch 25 or other sensor would need to be secured to the base 15 of the elongate element, although in each case, alternately the switch 25 or other sensor may be secured on the upper surface 19 of the fencing panel 12 or top rail or parts of a sensor may be secured to both the surface 19 and the channel element 14.

The element 14 has been described as extending between the posts. If desired, shorter lengths of element 14 may be provided, connected together as required. Preferably the or each element 14 is at least one half of a metre long.

In a further embodiment, the channel 14 or other elongate element may be secured at either end to the posts 10, 11, by suitable means which permit movement of the elongate element relative to the fencing panel 12 and posts 10, 11.

The invention is particularly applicable where the boundary member is over one and a half metres high, so that an intruder would need to scale the boundary member in order to cross the boundary defined thereby, and thus the intruder would have to apply substantially his entire weight to the element 14.

Referring now to Figure 3, a plurality of micro switches 25 of security devices described in Figures 1 and 2, in the present example four micro switches, are arranged in a control circuit in series so that the contacts of all of the micro switches 25 need to be closed to enable a current to flow through the switches.

A further micro switch 32 is shown in series with micro switches 25, which micro switch 32 may be provided on the alarm/control means so that any interference with the alarm/ control means, for example removal of a cover thereof, will open the contacts of switch 32 and electrical continuity will be broken.

A further micro switch 33 is shown, which may be used, for example to sense the opening of a gate.

Normally, the contacts of all of the micro switches 25, 32, and 33 would be closed and when the security device is actuated, current passes through contacts 37 and 38 of a relay from a battery 35 via a fuse 36', through the contacts of each of the micro switches 32, 33, and 25, and through the coil 36 of the relay.

Thus the contacts 37, 38 are maintained close by virtue of the current passing through the coil 36.

Any interruption in electrical continuity, for example by an intruder causing the contacts of one of the micro switches 25 to open, as hereinbefore described with reference to Figures 1 or 2, the coils 36 of the relay will be de-energised, and the contacts 37 and 38 will become broken. Further, if micro switch 32 or 33 is opened, the coils 36 of the relay will be de-energised. In each case, contact 37 will be connected to a further contact of the relay, contact 39, and current will flow through the contacts 37 and 39, to power a siren 40 to cause an audible alarm.

Current will only flow to the alarm 40 provided that a circuit breaker 43 is closed (as shown) by means of an operator's key, when the control circuit is actuated.

When the siren 40 is actuated, the siren 40 will continue to sound either until contacts 37, 39 are broken or until circuit breaker 43 is opened by an operator, as hereinafter described, or until the battery 35 becomes flat.

If an operator actuates a key device 34, to close a circuit between contacts 44 and 44', current will then again flow through the contacts of each of the micro switches 32, 33, and 25 to the coils 36 of the relay, provided of course that all of the contacts of the micro switches 32, 33, 25, are again closed, so that the contacts 37 and 38 of the relay will again become connected. At the same time as the con-

tacts 44 and 45 become connected by the key, the contact breaker 43 will be opened, and connection between contacts 37 and 39 of the relay will be broken so that current will cease to flow through the siren 40 so that the siren will cease to sound.

To reset the control means, contacts 44 and 44' are again broken by operating of the key device 34. The coils 36 of the relay will continue to receive current through the micro switches 25, 32, 33, from the contacts 37, 38 of the relay, and thus the contacts 37, 38, of the relay will remain closed.

Further features of the control circuit of Figure 3 are as follows.

When the key device is operated, to open circuit breaker 43 and close contacts 44, 44'. If any of the contacts of the micro switches 25, 32 or 33 are open, for example due to a fault in one of the switches, or if the circuit has otherwise been interrupted, a light emitting diode 41 (or other warning device) is caused to operate.

This is because the key device will close further contacts C,C' and current will be supplied to contacts C,C', through contacts 37, 39, of the relay, as coil 36 will be de-energised. Thus the circuit may be tested without operating the siren. Of course, any fault would need to be corrected before the system could be actuated or reset as hereinbefore described.

A test push button switch 45 is provided so that current can momentarily be provided to the siren 40 irrespective of the operating position of the relay or the contact breaker 43, to test the siren 40 and battery 35.

Battery 35 is rechargeable via a diode rectifier 46 and transformer 47 which receives current from the mains 48.

The connection between the battery 35 and the mains 48 may be permanent so that the battery recharges continuously provided that current is supplied thereto from the mains 48 as current is consumed by the control circuit. Alternatively, the battery 35 may only be connected to the mains for recharging as and when required by a plug-in connection to the mains.

As described, four micro switches 25 are provided in series in the circuit, although it will be appreciated that where a longer boundary is to be protected, many more than four micro switches 25 would be provided, each of the micro switches of one or more security devices as described, being connected in series in the circuit.

Micro switches 32, 33, may be omitted if not required, or other micro switches may be provided which are actuated by other means than those described above.

The control circuit described with reference to Figure 3 is only one example of a suitable control circuit. Any other control circuit to give an alarm when the contacts of a micro switch are made or broken, or when another switch is switched on or off, may be provided.

If desired, in a modification of the arrangement described above, each security device may comprise an inherently flexible member such as a tube of synthetic plastics material, for example PVC, of desired cross-section, with electrical contact means associated therewith. For example, the member may be provided with a pair of elongate electrically conducting wires or tapes which are normally maintained in mutual contact or out of mutual contact, depending on whether the control circuit is arranged to actuate the alarm means by breaking or making of the electric circuit, and moved respectively out of or into contact by predetermined movement of part of the member relative to another part thereof. Preferably, the inherently flexible member is also inherently resilient to provide a resilient biasing means to resist said movement so as to avoid, for example, actuation of theealarm means by an animal or wind.

Although the invention has b en described as he1ng applied to a boundary member comprising part of a fencing system, the invention can of course be applied to any other boundary member, such as a wall or part of a wall.

CLAIMS

1. A security device comprising an elongate element which is adapted to extend along an upper surface of a boundary member, means to sense a predetermined movement of said element relative to the boundary member and means to provide a signal to an alarm means when said predetermined movement is sensed.

2. A device according to Claim 1 wherein said elongate element extends along the boundary member for at least half a metre.

3. A device according to Claim 1 or Claim 2 wherein the boundary member comprises a fence having fencing panels which extend between posts and the elongate element extends the, or substantially the, entire distance between adjacent posts.

4. A device according to any one of the preceding Claims wherein the boundary member comprises a gate and the elongate element extends the, or substantially the, entire distance between the gate posts.

5. A device according to Claim 1 or Claim 2 wherein the boundary member comprises a wall and the elongate element extends along the entire wall which defines the boundary to be protected.

6. A device according to Claim 1 or Claim 2 wherein the boundary member comprises a wall and the elongate element is provided in sections.

7. A device according to any one of the preceding Claims wherein a plurality of shorter security devices are connected together to provide a longer boundary.

8. A device according to any one of the preceding Claims wherein a plurality of security devices are used together, the devices each having connecting means to enable each device to co-operate, operatively, with an adjacent device.

9. A device according to any one of the preceding Claims wherein said predetermined movement may only be obtained where a force greater than 20 kilograms is applied to the elongate member.

10. A device according to Claim 9 wherein said predetermined movement may only be obtained

where a force is greater than 40 kilograms is applied to the elongate member.

11. A device according to any one of the preceding Claims where the amount of said predetermined movement is governed by a resilient biasing means which acts between the elongate element and the boundary member, the force of the resilient biasing means being overcome as an intruder applies a greater force to the elongate element to cause said predetermined movement.

12. A device according to any one of the preceding Claims wherein said means which senses the predetermined movement of elongate element comprises a switch means, the contacts of which are broken as said predetermined movement is caused so that a break in electrical continuity provides a signal to the alarm means to cause it to operate.

13. A device according to any one of Claims 1 to 11 wherein the means which sense the predetermined movement of the elongate element comprises a switch means, the contacts of which are made as said predetermined movement is caused to provide a signal to the alarm means to cause it to operate.

14. A device according to any one of the preceding Claims where the elongate element comprises a downwardly opening channel-shaped element and the fencing panel, or a rail at the top of the fencing panel or other boundary member is received in the mouth of the channel.

15. A device according to Claim 14 wherein a securing means which permits of movement of the elongate member relative to the boundary member is provided to secure the elongate element to the boundary member.

16. A device according to Claim 15 wherein the fencing panel or top rail is made of timber or plastics material and the securing means comprises a fastener passing through the base of the channel into the fencing panel or top rail.

17. A device according to Claim 15 whenin the fencing panel or top rail is made of metal and the securing means comprises a fastener passing through the base of the channel into the fencing panel or top rail.

18. A device according to any one of the preceding Claims wherein a resilient biasing means controls movement of the elongate element relative to the boundary member.

19. A device according to claim 18 wherein the biasing means comprises a coil spring and a fastener received within the coils of the spring.

20. A device according to Claim 14 where apendant to Claim 12 or Claim 13 wherein the switch means is attached interiorly to one limb of the channel or to the base of the channel.

21. A device according to Claim 20 wherein the switch means is a micro switch and a trigger of the micro switch engages the boundary member as the predetermined movement occurs to cause the contacts of the micro switch to break or make.

22. A device according to Claim 21 wherein the position of the micro switch is adjustable to permit of adjustment of the amount of said predetermined movement of the elongate element which is required to actuate the alarm means.

23. A device according to any one of the preceding Claims wherein the security device comprises part of a security system comprising said security device, an alarm means and a control means.

24. A device according to Claim 23 where the alarm means comprises an audible, visual or other warning either at a location adjacent to the security device or at a location remote therefrom.

25. A device according to Claim 23 or Claim 24 when appendant to Claim 12 or Claim 13 or any one of Claims 14 to 24 when dependant directly or indirectly upon Claim 13 or Claim 14 wherein the control means comprises a control circuit which when electrical continuity of the switch means is maintained maintains the contacts of a switch, by which power is supplied to the alarm means, open.

26. A device according to Claim 25 wherein a plurality of switch means are provided along the elongate member, each switch means being arranged in series in the circuit so that any break in electrical continuity in any of the switch means or any of the conductors connecting the switch means signals the control means to operate the alarm means.

27. A device according to any one of Claims 23 to 26 wherein the control means and alarm means are battery operated.

28. A device according to any one of Claims 23 to 27 where the security system is key operable by an operator and when the alarm means has been actuated, the alarm may be arranged only to be deactivated by said key.

29. A device substantially as hereinbefore described with reference to the accompanying drawings.

30. A boundary member extending upwardly from the ground or other support surface having a security device according to any one of Claim 1 to 29 extending along an upper surface of the boundary member.

31. A boundary member according to Claim 30 wherein the boundary member is at least 1-1/2 metres high.

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